NCBN Protocol Development Summary

Protocol: Landscape Change

Parks Where Protocol will be Implemented: CACO, GATE, FIIS, SAHI, ASIS, GEWA, COLO, THST

Justification/Issues being addressed:

The primary goal of this protocol will be to monitor land cover change in both terrestrial and sub-tidal environments within all of the Northeast Coastal and Barrier Network (NCBN) parks. All NCBN parks have identified monitoring of land cover change as an important and necessary tool for future management practices. The Network's science committee also identified terrestrial and aquatic vegetation monitoring as a priority issue to be addressed by the NCBN inventory and monitoring program. Land cover change monitoring will help to establish a landscape context for each park, giving natural resource managers a better understanding of how park ecosystems fit into the broader landscape, and will assist them to prioritize ecosystem management. An assessment of land-cover changes over time will provide estimates of habitat changes within and around parks that can identify priority ecosystems to monitor within the park. The quantification of land-cover changes over time can be used to examine relationships between land-cover change and wetland plant communities (Lopez et al., 2002), water quality, and general ecosystem health (Paruelo et al., 2001). By developing and implementing a protocol to efficiently and cost effectively monitor land cover change within NCBN parks, the current knowledge of park ecosystem dynamics will be further advanced, allowing for better management practices and decision making in the future.

Specific Monitoring Questions and Objectives to be addressed by the Protocol include:

Objective 1: Quantify landscape change in and around Northeast Coastal and Barrier Network Parks.

- **Question 1:** *How are the dominant habitat cover types changing over time (both terrestrial and subtidal aquatic habitats)?*
  - **Vital Sign 1:** Landscape Pattern
- **Question 2:** *How are landscape pattern metrics (e.g., indices of habitat: patch size, patch density, fragmentation, and isolation) changing over time?*
  - **Vital Sign 1:** Landscape Pattern

Vital Signs, measurements, justifications and basic approach:

Vital Sign: Landscape Pattern

- **Measurement:** Patch size distribution and distance between patches.
- **Justification:** Land cover changes may be expressed as loss of habitat area (see above) or as changes in habitat configuration. Landscapes metrics that

define the degree of habitat fragmentation and patch isolation are necessary to provide a more complete picture of land cover change. At the most basic level, an understanding of the size distribution of patches and the distance between them will help land manager to understand and manage threats to the coastal ecosystem habitats.

Basic Approach:

This protocol is in a development phase in which methods for land cover mapping are being reviewed and compared to determine the most time and cost efficient way to monitor in the network parks. Efficient remote sensing data sources and technical approaches to map both terrestrial and submerged aquatic vegetation in NCBN parks are being explored. The goal will be to develop a long-term coastal monitoring program using advanced remote sensing data and geographic information technology. Currently methods are being tested on Fire Island National Seashore (FIIS).

Terrestrial near-shore vegetation and seagrass beds are being mapped for FIIS using high spatial resolution QuickBird-2 multi-spectral satellite remote sensing data. It is being determined whether the high spatial resolution satellite data can meet the current NPS vegetation mapping standards. This repeatable data acquisition will facilitate the development of a dynamic monitoring program for the network. Estuarine and submerged aquatic habitats are also being mapped using hyperspectral remote sensing data. Recent developments of new multi-spectral and hyperspectral sensors offer a cost-effective solution to seagrass information extraction. Increased spectral and spatial resolutions of these sensors allow for greater penetration into the water column and the acquisition of more spatially and spectrally detailed images of submerged habitats. Because hyperspectral sensors are able to image energy throughout the visible to thermal infrared portion of the spectrum, digital image processing techniques can extract the information efficiently and it is less labor intensive.

As part of this protocol testing phase, satellite derived vegetation maps will be compared with the FIIS NPS vegetation mapping delineation, recently completed. Methods will be compared and a determination made whether repeat monitoring of vegetation change using remote-sensing technology is feasible in a reasonable time frame and cost. Because the FIIS NPS vegetation map does not include submerged aquatic vegetation (SAV) satellite derived SAV maps will be compared with current efforts to delineate SAV beds via photographic surveys. Again, methods will be compared and a determination made whether repeat monitoring of change in SAV beds using remote-sensing technology is feasible in a reasonable time frame and cost. Once this testing phase is complete, and cost and time efficiency determined feasible for use in the network's long-term monitoring program, a protocol will be written detailing the use of high spatial resolution satellite remote sensing data for estuarine and terrestrial vegetation habitat mapping.

Principal Investigators and NPS Lead:

Protocol development will be done through a cooperative agreement with the University of Rhode Island (URI). Principal Investigators will be Y.Q. Wang and Michael Traber. NPS Leads: Bryan Milstead and Sara Stevens.

Development Schedule, Budget, and Expected Interim Products:

The URI principal investigators (PIs) will develop and draft the full inclusive monitoring protocol to include an extensive narrative describing the full protocol as well as specific SOPs meeting the NPS I&M Program standards. The PIs will produce a draft landcover change protocol ready for external peer review by the end of 2006. After peer review, revision and approval, the implementation of the protocol will be based on the recommended sampling scheme determined in the written protocol. $58,000 was budgeted in FY 2004 for protocol development additional funds may be added in FY 2005.

Literature Cited

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Wang, Y. and D.K. Moskovits, 2001. Tracking Fragmentation of Natural Communities and Changes in Land Cover: Applications of Landsat Data for Conservation in an Urban Landscape (Chicago Wilderness), Conservation Biology, 15(4): 835-843.

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